

Description of Meeting

Summary

Title of Meeting: Molecular Biology of Signal Transduction in Plants
Location: Cold Spring Harbor Laboratory
Dates: October 2 - 6, 1991.
Expected Attendance: 200 - 250 researchers from U.S. and abroad

The meeting on Molecular Biology of Signal Transduction in Plants will be an open international meeting to be devoted to fundamental research on different aspects of this field, with an emphasis on molecular and genetic approaches. The development of a higher plant is regulated by a multitude of signals from within and without, that evoke both generalized and specific biological responses. Therefore an understanding of signal transduction in plants is vital to understanding plant development. The need for a meeting on this subject is evidenced by the rapid advances in this field during the last few years, in areas that range from environmental receptors to transcription factors. This meeting will allow presentation of recent results and methodologies in these different aspects of the field within a common framework, in an atmosphere of face to face contact. The meeting should spur further research and the synthesis of ideas in this rapidly moving field.

The areas to be covered by the meeting are: (1) Environmental Receptors (2) Hormone Receptors (3) Cell-Cell Recognition (4) G Proteins and Protein Kinases (4) Transcription Factors (5) Mutants in Signalling Pathways (6) Transgenic Approaches.

Significance

The development of a plant depends upon the co-ordinated division, expansion and differentiation of non-motile cells in response to both internal and external signals. Internal signals may be broadly defined as signals within the plant that are involved in communication between individual cells or cell layers during plant morphogenesis or differentiation (*e.g.*, the plant growth hormones -auxin, cytokinin, *etc.*). External signals include light, temperature, gravity, touch and pathogens; such signals are known to regulate many basic developmental processes in plants such as flowering, seed maturation, germination and nodulation. Therefore, elucidation of the basic mechanisms of plant signal transduction (*i.e.*, the molecular nature of the processes that lie between reception of the signal and the biological response), is a fundamental requirement for understanding plant development. In recent years, the successful utilization of molecular and genetic approaches have yielded new insights into these mechanisms. Major developments over the decade include cloning of genes for phytochromes, self-incompatibility, G-proteins, tyrosine kinases and transcription factors from plants. In addition, many genetic loci have been identified that mediate responses to light, auxin, ethylene, *etc.* Several of these developments have occurred within the last two or three years. This meeting will cover the different aspects of signal transduction in plants, from receptors to transcription factors, with an emphasis on molecular and genetic approaches.

Need for meeting

Although the area of signal transduction in plants has received some attention at recent meetings on plant biology, there have been few meetings dedicated solely to this topic. Because of the recent advances in this research area, this meeting will be both timely and valuable in bringing together scientists who are working on very different aspects of this problem (*e.g.*, hormone receptors, protein kinases, transcription factors, *etc.*). The aim of the meeting would be to allow researchers working on these very different aspects of the same problem to interact within the format of a Cold Spring Harbor meeting, with the hope that the meeting will enable them to view their own research in the light of a more unified model, and thereby stimulate further inquiry.

Meeting Format

The topic and the chairperson for each session is described below. The topics follow a logical progression from signal reception to transcription, with two sessions devoted to methodologies and genetic approaches. Chairpersons have been selected for their familiarity with the topic, and position in the field. In keeping with the spirit of broad participation, the chairpersons include both established and new investigators.

SESSION 1 - Reception of Environmental Signals

Chairperson: Dr. Joanne Chory, Salk Institute.

Because higher plants are immobile, the ability to respond to their environment is more critical than for animals; therefore they have evolved complex mechanisms to regulate their growth and development in response to environmental signals. In this session, the mechanisms used by the plant to sense light, gravity, and environmental stresses will be the focus. Included in this session will be phytochrome regulation, and progress towards cloning other genes involved in mediating the light response (e.g., the *det* genes in *Arabidopsis*), as well as genes that mediate responses to other environmental stimuli.

SESSION 2 - Reception of Hormonal Signals

Chairperson: Dr. Joseph Ecker, University of Pennsylvania.

This session will focus on the genes that are involved in mediating responses to plant hormones. Examples of topics that would fall into this session are putative hormone receptors (e.g., auxin binding proteins), as well as genes that mediate the responses to plant hormones such as abscisic acid or ethylene (e.g. *vp1* in maize or *etr* in *Arabidopsis*).

SESSION 3 - Cell-Cell Recognition

Chairperson: Dr. June Nasrallah, Cornell University.

This session will focus on the mechanisms by which plant cells communicate with each other or with pathogens or symbionts, e.g., recognition of self or non-self for self-incompatibility in fertilization of many plants, or the recognition of pathogens that triggers the hypersensitive response.

SESSION 4 - G Proteins and Protein Kinases

Chairperson: Dr. Hong Ma, Cold Spring Harbor Laboratory.

Studies on animal and yeast systems have shown the importance of G proteins and protein kinases as intermediaries in signal transduction. Recently genes for G proteins and protein kinases from plants have been cloned. Progress on their characterization, as well as research on the involvement of these proteins in plant signal responses, will be discussed in this session.

SESSION 5 - Targets of Signals I

Chairperson: Dr. Enrico Coen, John Innes Institute, U.K.

SESSION 6 - Targets of Signals II

Chairperson: Dr. Sarah Hake, USDA Plant Gene Expression Center.

These two sessions will focus on the last stage of the signal transduction process, that is, the changes in gene expression that lead to the biological response, *i.e.*, growth and/or differentiation. Genes that regulate basic developmental processes such as flowering and leaf morphogenesis, and transcription factors in plants, will be discussed within this context; a number of these genes have been cloned recently (*e.g.*, *deficiens* in *Antirrhinum*, *agamous* in *Arabidopsis*, *Knotted* in maize, the TGA1 factors from tobacco).

SESSION 7 - Mutants in Signalling Pathways

Chairperson: Dr. Yoshiro Shimura, Kyoto University, Japan.

This session will focus on the identification of new genetic loci, and further characterization of previously identified loci. There has been a rapidly expanding number of such mutants, particularly in *Arabidopsis*.

SESSION 8 - Transgenic Approaches and Technologies

Chairperson: Dr. Robert Horsch, Monsanto.

An extremely important step in the analysis of the function of a cloned gene is the ability to re-introduce the gene into the plant following *in vitro* modification. In most plant systems, transformation is still a time-consuming and inefficient procedure, and often constitutes the chief bottleneck in many studies. Therefore it was felt that it was both important and necessary to have a session on gene-transfer techniques, with the objective of enabling researchers to become acquainted with the latest methods used to make transgenic plants in various plant systems. It is hoped that the format of this meeting will encourage researchers not normally working on transformation (or who have had discouraging experiences with the published protocols), to learn the details and "tricks" that are sometimes lost in the larger meetings.